Organizational Aspects of Building a Gas Jet Target for PP2PP

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Abstract

The recent experiences planning and executing the IUCF polarized ion source project CIPIOS will be extended to the construction of a gas jet target for PP2PP. The CIPIOS project was schedule driven in that IUCF was committed to delivering polarized beam to users by the end of the summer quarter, 1999. CIPIOS is similar to the jet target in complexity, cost and manpower requirements. A schedule for the PP2PP gas jet target with a May, 2001 completion date is examined and the requirements to meet such a tight schedule are discussed.

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ORGANIZATIONAL ASPECTS OF BUILDING A GAS JET TARGET FOR PP2PP

Objectives:

- Give some idea of the scope of the project.
- Estimate rough costs and schedule based on building from scratch.
- Discuss how the project needs to proceed in order to have a jet target installed by “Spring 2001".

Scope of a Source Project

Physicist's View

- What is the experiment?
- What luminosity is required?
- What are the techniques available to achieve this luminosity?
- How can we do this in the shortest time possible with (preferably) no money?

If an ABS is chosen then;

- Dissociator design and atomic beam characteristics for input to:
- The magnet design.
- What holding field is allowed, one atomic state or two?
- How to incorporate an unpolarized target?
- Impact on RHIC beam?

Engineer's View

- How will a jet target fit into the available space?
- Vacuum system design and impact on RHIC vacuum and beam.
- Mechanical mounting issues and access for maintenance and repair.
- What services are required and what exists? (Power, cooling water, cabling in and out, air, etc.)
- How much remote control and monitoring is required and where is the control and data acquisition room?
- What computer hardware and interface will be used?
- Safety issues, interlocks, equipment protection, etc...

Project Manager View

- How can I keep the Engineer from overspending 150%?

Configuration management:

- Specifications,
- Schematics,
- Documentation of all cables, devices, interlocks, services, etc..

Cost planning:

- Make purchasing decisions based on input from previous two columns.

Scheduling:

- Schedule tasks and follow up on progress.

Manpower:

- Acquire resources.
- Personnel management.

COST

N.B. Cost estimates based on CIPIOS experience. Manpower not included.

Group into major areas:

a) Vacuum system components,
b) Functional ABS components,
c) Functional Polarimeter components,
d) Controls and services.

Vacuum system components:

1) PUMPS (ABS)		171 k$
• 3 x 2200 l/s turbos (optimistic pricing)	105 k$	
• 2 x Roots pumps	20 k$	
• Mechanical pumps	12 k$	
• 3 1500 l/s cryopumps	34 k$	
2) PUMPS (Polarimeter)		32 k$
• 1 x 1500 l/s turbo	24 k$	
• 1 x dry pump	8 k$	
3) PUMPS (Differential on RHIC)		52 k$
• 4 x 1500 l/s cryopumps	52 k$	
• Mechanical pump for regeneration	4 k$	
4) HARDWARE		57 k$
• Gatevalves, foreline valves, vent valves, etc	32 k$	
• Pressure monitors	15 k$	
• Misc hardware	10 k$	
5) CHAMBER, MOUNTING		45 k$
• ABS, Polarimeter and Target box	35 k$	
• Stand, stand hardware	10 k$	
TOTAL - VACUUM HARDWARE AND STAND		**357 k$**

Functional ABS components:

1) DISSOCIATOR		62 k$
• Diss assembly (no cryo or p.s.'s)	30 k$	
• Microwave power supply/hardware	8 k$	
• Cooling for cold nozzle, temp control	24 k$	
2) MAGNETS		72 k$
• Six PM sextupoles with enclosures	72 k$	
3) XTION UNIT(S)		6 k$
• One WF transition unit with p.s.'s, r/o's	6 k$	
TOTAL - FUNCTIONAL ABS COMPONENTS		**140 k$**

Functional Polarimeter components:

1) MAGNETS		19 k$
• Two PM sextupoles with enclosures	19 k$	
2) XTION UNIT(S)		6 k$
• One WF transition unit with p.s.'s, r/o's	6 k$	
3) DETECTOR		17 k$
• QMS and electronics	12 k$	
• Chopper	5 k$	
TOTAL - FUNCTIONAL POLARIMETER COMPONENTS		**42 k$**

Control Hardware:

1) PLC		18 k$
• Processor	3 k$	
• I/O channels, p.s.'s, hardware	15 k$	
2) GUI		23 k$
• Processor	15 k$	
• I/O	8 k$	

TOTAL - CONTROL HARDWARE **41 k$**

GRAND TOTAL **580 k$**

A reduction in the final cost can be realized if there are some donations of vacuum equipment to the project.

SCHEDULING

Must be completed and installed by
“Spring 2001"

Two methods to plan a project:

- Schedule Driven
- Resource Driven

Given the required date of completion, this project is *schedule driven.* In order to meet the schedule, sufficient resources (manpower and money) must be available during the peaks in activity.

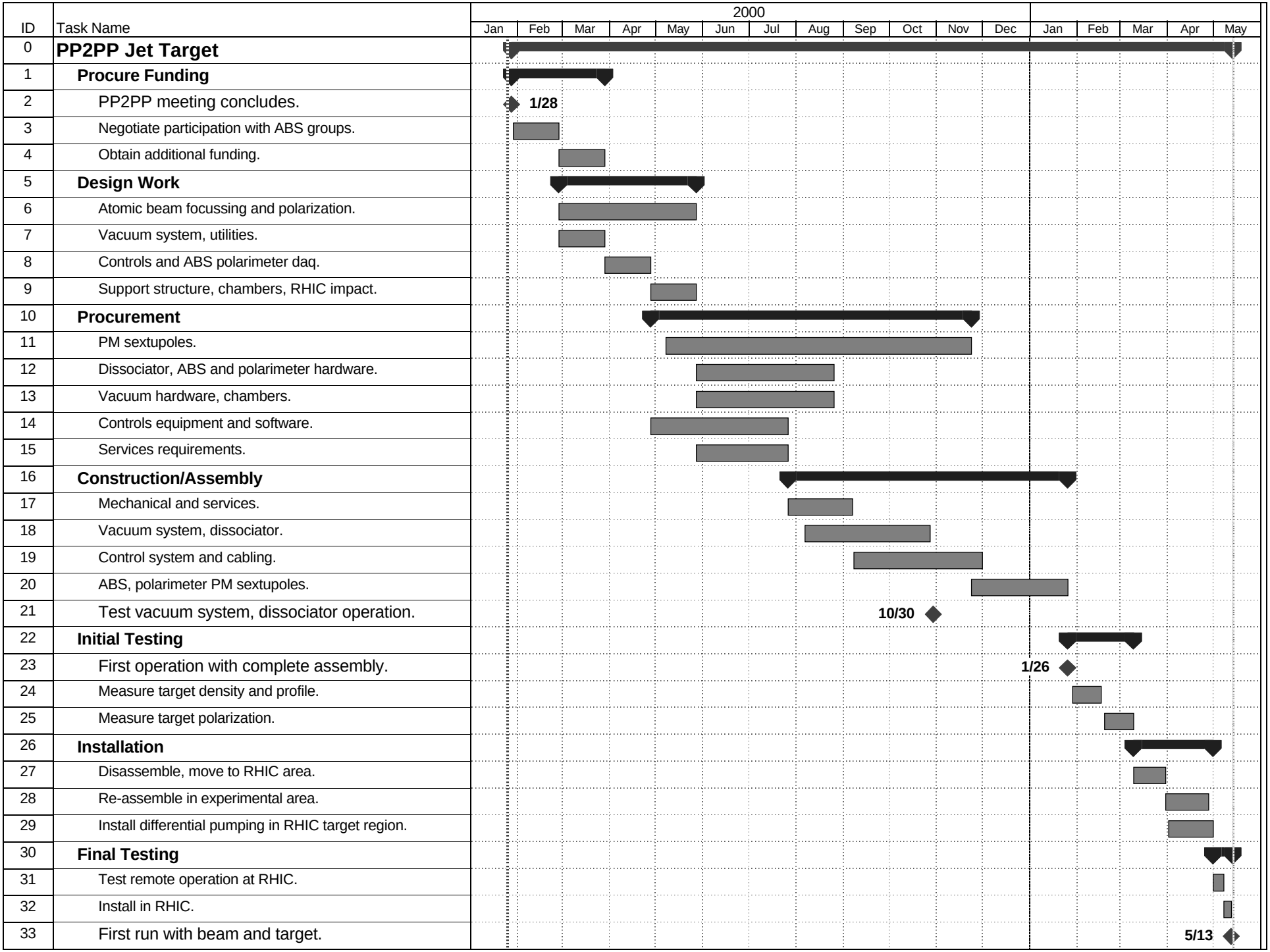
COMMENTS ON SCHEDULING

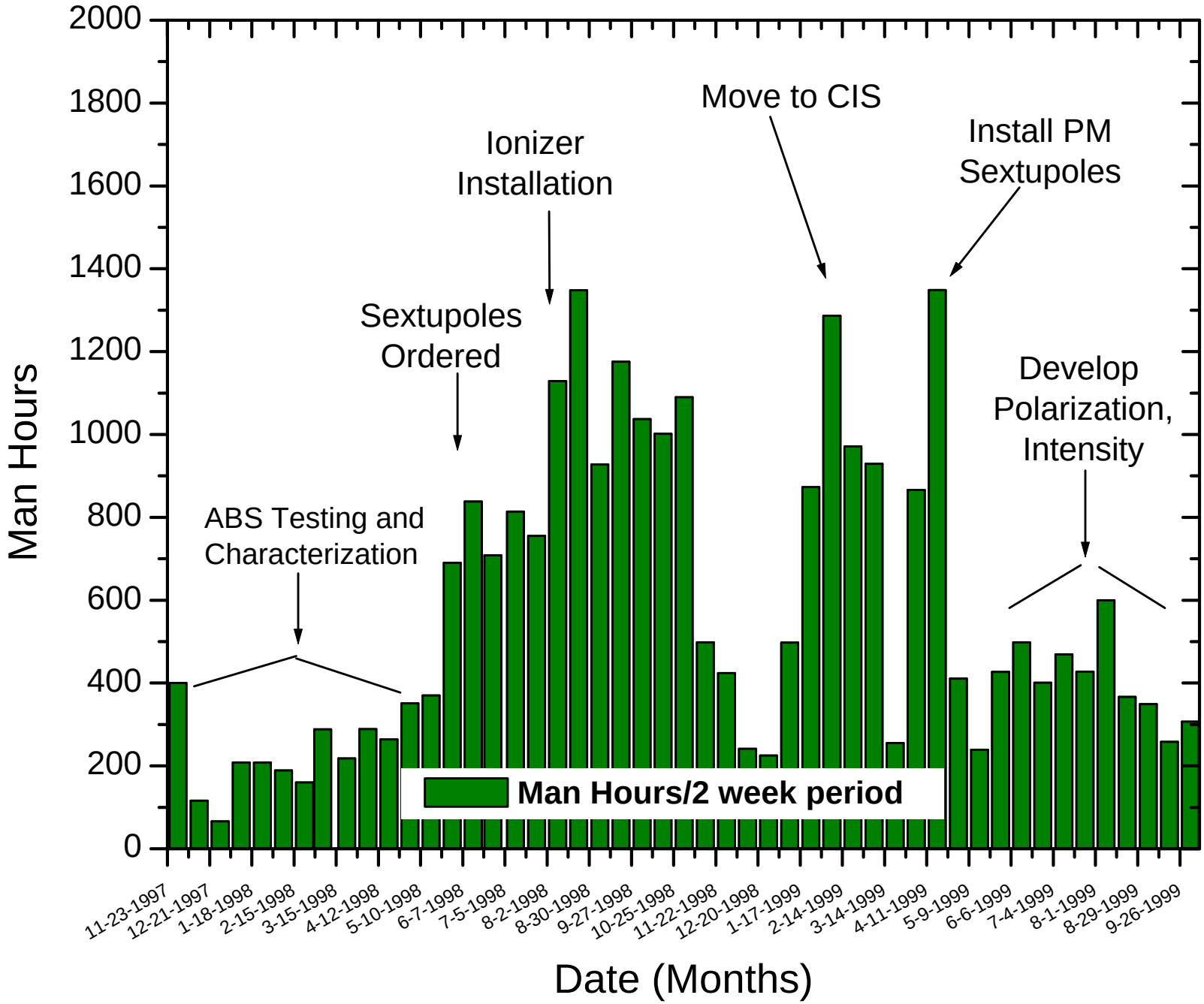
To Finish By “Spring 2001":

- This is a ***VERY*** optimistic schedule. Everything must go smoothly to meet the “finish by” date.
- Time estimations do not take into account development of new or untested ideas.
- Experience and data from other Atomic Beam Sources should be used extensively. Use known technology.
- Many tasks must be completed in parallel. Coordination between groups and BNL is important.
- Plan to use “off the shelf” or commercially made items when available.
- Manpower for design, engineering, construction, assembly and testing must not be a constraint.

COMMENTS ON MANPOWER

- Manpower use is ***always*** underestimated.
- Manpower must be available when needed by the project.
- There must be one person who has the time and commitment to oversee the whole project, who will:
  - coordinate the effort of all groups involved,
  - plan to have the manpower and resources available when needed,
  - can make or help arrive at critical design decisions based on cost and schedule, and
  - coordinate the project to match RHIC requirements and standards.


2000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
ID
Task Name
0 PP2PP Jet Target
1 Procure Funding
2 PP2PP meeting concludes.
1/28
3 Negotiate participation with ABS groups.
4 Obtain additional funding.
5 Design Work
6 Atomic beam focussing and polarization.
7 Vacuum system, utilities.
8 Controls and ABS polarimeter daq.
9 Support structure, chambers, RHIC impact.
10 Procurement
11 PM sextupoles.
12 Dissociator, ABS and polarimeter hardware.
13 Vacuum hardware, chambers.
14 Controls equipment and software.
15 Services requirements.
16 Construction/Assembly
17 Mechanical and services.
18 Vacuum system, dissociator.
19 Control system and cabling.
20 ABS, polarimeter PM sextupoles.
21 Test vacuum system, dissociator operation.
10/30
22 Initial Testing
23 First operation with complete assembly.
1/26
24 Measure target density and profile.
25 Measure target polarization.
26 Installation
27 Disassemble, move to RHIC area.
28 Re-assemble in experimental area.
29 Install differential pumping in RHIC target region.
30 Final Testing
31 Test remote operation at RHIC.
32 Install in RHIC.
33 First run with beam and target.
5/13


Man Hours
2000
1800
1600
1400
1200
1000
800
600
400
200
0
ABS Testing and Characterization
Sextupoles Ordered
Ionizer Installation
Move to CIS
Install PM Sextupoles
Develop Polarization, Intensity
Man Hours/2 week period
11-23-1997
12-21-1997
1-18-1998
2-15-1998
3-15-1998
4-12-1998
5-10-1998
6-7-1998
7-5-1998
8-2-1998
8-30-1998
9-27-1998
10-25-1998
11-22-1998
12-20-1998
1-17-1999
2-14-1999
3-14-1999
4-11-1999
5-9-1999
6-6-1999
7-4-1999
8-1-1999
8-29-1999
9-26-1999
Date (Months)